

FORM FOUR CLUSTER KCSE MODEL8

CHEMISTRY PAPER 3 ANSWER

1. **TABLE 1**

Titration Number	1	2	3
Final burette Reading (cm ³)	12.5	25.0	37.5
Initial burette Reading (cm ³)	0.0	12.5	25.0
Volume of N used (cm ³)	12.5	12.5	12.5

a) Complete table 1mk

Complete table with 3 titrations done 1 mark

Incomplete table with 2 titrations done ½ mark

Incomplete table with 1 titration done 0

b) Use decimals 1 mark

c)i) Accuracy 1 mark

If atleast one of the candidates values is within ± 0.1 1 mark

If no value is within ± 2.0 of teachers ½

Principle of averaging 1 Values to be averaged should be those within ± 2.0 of each other. Final

answer

1 Calculations

ii)

$$\left(\frac{25.0 \times 1}{1000} \right)^{1/2} \\ = 0.025 \text{ moles}^{1/2}$$

iii

Mole ratio of $\text{NaOH} : \text{H}_2\text{SO}_4$

2 : 1

$$\begin{aligned}\text{Number of moles of solution } N &= \frac{0.025}{2} \sqrt{1/2} \\ &= 0.0125 \text{ moles } \sqrt{1/2}\end{aligned}$$

iv)

$$\frac{100 \times 0.0125}{\text{average titre}} \sqrt{1/2}$$

Answer $\sqrt{1/2}$

v)

Table 2

Conditions to apply as in table 1

Calculations

$$\begin{aligned}\text{No of moles of NaOH used} &= \frac{25.0 \times 1}{1000} \sqrt{1/2} \\ &= 0.025 \text{ moles} \sqrt{1/2}\end{aligned}$$

$$\begin{array}{ccc}\text{Mole ratio NaOH} & : & \text{H}_2\text{SO}_4 \\ 2 & : & 1\end{array} \sqrt{1/2}$$

$$\begin{aligned}\text{No of moles of solution K used} &= \frac{0.025}{2} \sqrt{1/2} \\ &= 0.0125 \sqrt{1/2}\end{aligned}$$

iii) Moles of H_2SO_4 in 100cm^3 of solution

$$= \frac{100 \times 0.0125}{\text{average titre}} \sqrt{1/2}$$

$$\text{Answer} = \sqrt{1/2}$$

iv) No. of moles of H_2SO_4 = answer in (iv) above - answer in (b) (iii) of reacted $3 \text{X}_2\text{CO}_3$

= Answer $\frac{1}{2}$

$$\begin{array}{ccc}\text{Mole ratio} & & \text{X}_2\text{CO}_3 : \text{H}_2\text{SO}_4 \\ & & 1 : 1\end{array} \sqrt{1/2}$$

Moles of X_2CO_3 in 0.5 g = answer (iv) above.

$$0.5 \text{ g of } \text{X}_2\text{CO}_3 = \text{answer (iv) above} \times 1 \text{ mole}$$

$$\begin{aligned}\text{Relative formula mass} &= \frac{1 \times 0.5}{\text{Answer in (iv)}} \sqrt{1/2} \\ &= \text{Answer} = \sqrt{1/2}\end{aligned}$$

vi) 1 mole of X_2CO_3 = Answer in (v) above)

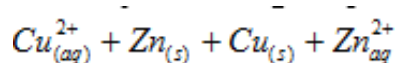
$$\begin{aligned}\therefore X &= \frac{\text{Answer in (v)} - 60}{2} \sqrt{1/2} \\ &= \text{Answer} \sqrt{1/2}\end{aligned}$$

2. Temperature of $\text{CuSO}_{4\text{aq}}$ = 24.0°C (1 mark)

Highest temperature of mixture = 30.00°C (1 mark)

Temperature change ΔT
 $= 30 - 24 = 6^\circ\text{C}$

Accuracy of reading temperature 1 mark



ii) Moles of copper sulphate used in the reaction.

ii) Moles of copper sulphate used in the reaction.

$$\left(\frac{0.2 \times 25}{1000} \right) \sqrt{1/2}$$

$$= 0.005 \text{ mole} \sqrt{1/2}$$

$$\text{iii) Heat evolved} = \left(\frac{25}{1000} \times 4.2 \times 6 \right) \sqrt{1/2}$$
$$= 0.63 \text{ kJ} \sqrt{1/2}$$

$$\text{iv) } 0.005 \text{ moles} \rightarrow 0.63 \text{ kJ}$$

$$\therefore 1 \text{ mole} \rightarrow \frac{0.63}{0.005} \times 1 \sqrt{1}$$

$$= -126 \text{ kJ / mole} \sqrt{1}$$

3.

Inference

Possibly Zn^{2+} , Pb^{2+} or Al^{3+} ions present ✓1 for all the three. 1/2 for any two.

ii) **Observation**

-A white precipitate is formed. ✓1/2

-It dissolves in excess ammonia to form a colourless solution. ✓1/2

Inference

Zn^{2+} ions present ✓1 or Al^{3+} , Pb^{2+} ion absent

iii) **Observation**

-A white precipitate is formed. ✓1/2

-The white precipitate is insoluble in an acid. ✓1/2

Inference

SO_4^{2-} ions present ✓1

b)i) **Observation**

-A pale blue precipitate is formed. ✓1/2

-The precipitate is insoluble in sodium hydroxide. ✓1/2

Inference

Cu^{2+} ions present. ✓1

ii) **Observation**

-A pale blue precipitate is formed. ✓1/2

-The precipitate dissolves in excess ammonia to form a deep blue solution. ✓1/2

Inference

Cu^{2+} ions present